

Phase Equilibria and Critical Phenomena in Ternary Aqueous Ionic Systems

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Both phase behavior and criticality in ionic systems are still a matter of discussion. At the center of the debate is the coupling between long-range coulombic interactions and long-range critical fluctuations and its influence on the nature of the ionic critical phenomena. Although there are strong evidences revealing that, asymptotically close to the critical point, coulombic and solvophobic ionic systems display Ising behavior [1,2], recent theoretical results [3-5] suggest these systems may form a charged-ordered phase, with the appearance of a Néel line of critical points and a tricritical point. This prediction has been supported by an experimental study [6], where the formation of a micro-heterogeneous phase of ions and molecules was proposed to interpret the results. In this work, we present experimental results of the study of several aqueous ionic systems with intermediate dielectric constants. Refractive index, electrical conductivity and turbidity of ternary systems containing water, an organic liquid and an inorganic salt were measured in the one- and two-phase regions. For high electrolyte concentrations, conductivity measurements indicate strong ionic association; its effect on the phase equilibria is pronounced. Although some of the investigated systems were previously signaled out as possibly displaying multicritical behavior, we were unable to find experimental evidences of a continuous phase transition in ionic systems.

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